Catalogue of American Amphibians and Reptiles.

SCHAAF, RAYMOND T., JR., AND PHILIP W. SMITH. 1971. *Rana palustris.*

Rana palustris LeConte
Pickerel frog

Rana palustris LeConte, 1825:282. Type-locality not stated. Designated as vicinity of Philadelphia, Pennsylvania, by Schmidt, 1953:83. No type-specimen known to exist.

Rana pardalis Harlan, 1826:59 (*nomen nudum*, name intended by Harlan for the new species described by LeConte).

Rana palustris mansuetii Hardy, 1964:91. Type-locality: "Maxton Pond, approximately one mile southwest of Maxton, Robeson County, North Carolina." Holotype, U. S. Natl. Mus. 150535, a female, collected 26 February 1961 by Jerry D. Hardy, Jr.

• CONTENT. No subspecies are currently recognized (see Comment, below).

• DEFINITION. A smooth-skinned frog usually between 60 and 70 mm snout-vent length that has dark brown or black dorsal blotches typically arranged in two regular rows and, in most of its range, squarish or rectangular blotches. In life it has a bright yellow wash on the concealed surfaces of the hind legs and belly. The glandular, yellowish dorsolateral fold is about half the width of a dorsal blotch in large-spotted frogs and more than half in small-spotted frogs. The ground color is gray or tan.

• DESCRIPTIONS. Numerous descriptions of the adult include those by Dickerson (1906), Babbitt (1937), Walker (1946), Wright and Wright (1949), H. M. Smith (1956), Hardy (1964), and Schaaf and Smith (1970). The brown and yellow egg averages 1.7 mm in diameter and has two envelopes, the outermost 4 mm in diameter. The egg mass is a firm, globular submerged mass. A female produces 2,000–3,000 eggs in several such masses (Wright, 1914). The tadpole is olive green with fine black and yellow spots; its tail darker with the yellow spots coalesced into larger spots (Wright, 1914). The egg, egg mass, and tadpole are also described by Babbitt (1937) and Wright and Wright (1949).

• ILLUSTRATIONS. The egg is figured by Wright (1914), Livezey and Wright (1947), and Wright and Wright (1949); the tadpole by Wright (1914) and Wright and Wright (1949) and its mouthparts by Wright (1914). The adult is illustrated in color on the front cover of the Dover reprint of Dickerson's "The Frog Book." For pictures of the adult, also see Conant (1957 and 1958), P. W. Smith (1961), and Huheey and Stupka (1967).

• DISTRIBUTION. *Rana palustris* occurs from the Gaspé Peninsula to the west end of Lake Superior and southward to the Gulf Coast of east Texas. It is absent in the predominantly prairie regions of Illinois and adjacent states (Smith and Minton, 1957) and, except for a relict population in Conecuh Co., Alabama (Brown and Boschung 1954), does not occur on the Coastal Plain of Alabama and Georgia. A record for Prince Edward Island is erroneous (Cook 1967) and one for northern Ontario above the 50th parallel is doubtful (Bleakney, 1958). Neither is plotted on the map. Distribution in Canada is treated by Logier and Toner (1961) and Bleakney (1958); in the United States, by many authors of regional faunal lists and local checklists. (Thompson and Thompson, 1912; Babbitt, 1937; Oliver and Bailey, 1939; Bailey, 1944; Breckenridge, 1944; Conant, 1945; Walker, 1946; Wright and Wright, 1949; Suzuki, 1951; Grant, 1959; Rossman and Gosner, 1959; P. W. Smith, 1961). M. M. Hensley, C. J. McCoy, S. A. Minton, and R. G. Zweifel (pers. comms.) provided additional data.

North of the coastal plain boundary, *Rana palustris* occurs where the water is cool and clear. On the Coastal Plain, it occupies floodplain swamp. In karst topography, *R. palustris* is often confined to the vicinity of the cave mouth.

• FOSSIL RECORD. No fossils are known.

• PERTINENT LITERATURE. Geographic variation and ecology are discussed by Hardy (1964) and Schaaf and Smith (1970). Breeding behavior, voice, oviposition, hatching, and development are treated by Wright (1914), and embryonic development by Rugh (1948). Phonograph recordings of the mating call are available on "Voices of the Night" (Comstock Publishing Company) and "Sounds of North American Frogs" (Folkways). The food of the adult is discussed by Pope (1944), and of the tadpole by Wright and Wright (1949). Huheey and Stupka (1967) reported a record-sized specimen. Dickerson (1906), Babbitt (1937), Parker (1939), Wright and Wright (1949), Hardy (1964), and Schaaf and Smith (1970) summarized habits and habitats. Sweet (1960) reported a hibernating aggregation.

Rugh (1935), J. A. Moore (1946) A. B. C. Moore (1950) experimentally crossed *R. palustris* and *R. pipiens*; Salthe (1969) described the lactate dehydrogenases of natural hybrids. J. A. Moore (1955) summarized hybrid crosses, and Mecham (1969) provided additional data. Brattstrom (1968) studied thermal acclimation, and Easton (1953) studied movements of

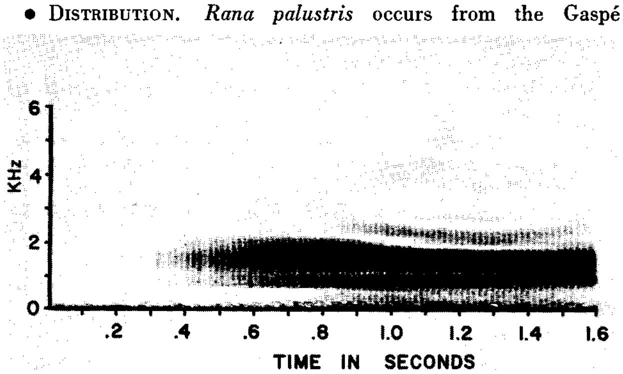
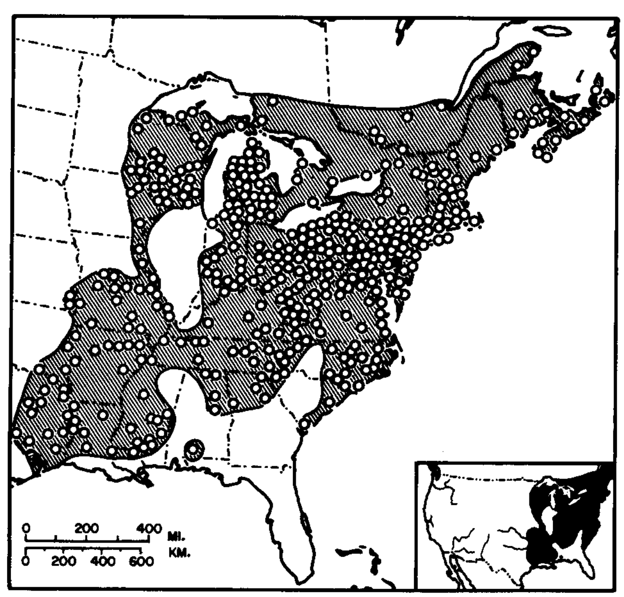


FIGURE. Audiospectrogram (narrow band, 45 Hz) of mating call of *Rana palustris*: Bergen County, New Jersey, 27 April 1969, body temperature 18.8°C, specimen Amer. Mus. Nat. Hist. 82332 (Amer. Mus. Nat. Hist. Dept. Herpetology tape library).



MAP. The solid circle marks the type-locality; open circles indicate other records.

foreign substances through tissues. Bradley (1951) and Dent and Hunt (1952) studied uptake of radioactive iodine; Wyburn and Bacsich (1948) grafted tissues of larval *R. temporaria* to *palustris* tadpoles. Hutchison *et al* (1968) studied gas exchange.

Harlan (1826), Dickerson (1906), and most subsequent discussions of the habits of *R. palustris* mention a distasteful and irritating skin secretion. Wright (1914) suggested that the chrome yellow underparts may serve as warning coloration. Dunn (1935) and Babbitt (1937) described the effects of the secretion on frog-eating snakes. Dunn (1935) suggested a relationship between size of the dorsolateral folds and quantity of secretion. Mulcare (1965) studied toxicity experimentally.

Probable selection pressures affecting pigmentation are noted by Hardy (1964) and are discussed in detail by Schaaf and Smith (1970).

• REMARKS. Investigations of the alleged toxicity, comparative developmental studies of coastal plain and upland frogs, and experimental studies to corroborate the advantages of different phenotypes to different environments as postulated by Schaaf and Smith (1970) are needed.

• ETYMOLOGY. The specific name is from the Latin *paluster*, meaning "of the marsh."

COMMENT

The distinctively marked subspecies *mansuetii* was described by Hardy (1964) and synonymized by Schaaf and Smith (1970). If *mansuetii* were to be recognized, its range would have to be revised to include all populations on the Gulf Coastal Plain and the Atlantic Coastal Plain, including the Del-Mar-Va Peninsula. However, all of Missouri and most of Virginia, North Carolina, Tennessee, Mississippi, and Arkansas contain intermediate populations unassignable to subspecies.

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